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• POPULATION DENSITY LIMITATION OF AN ESTUARINE DIATOM BY ILLUMINATION AND NITROGEN SOURCE. *Randolph L. Ferguson.* Mature phase population density of the estuarine diatom *Thalassiosira pseudonana* Hasle clone 3H was examined in response to changes in illumination intensity, 0 to 1.8×10^4 lux, length of the daily light period, 12 or 24 hours, and to nitrogen sources and concentrations. Similar light-limited population densities occurred with the two daily light periods at illumination intensities below 4000 lux. Maximum population density was observed with continuous illumination intensities from 5375 lux to the highest intensity tested. With 12 hours illumination per day, population density increased slowly with intensity and at 15,000 lux the density was less than half the maximum observed with continuous illumination. Estimates of seasonal light penetration into southeastern United States estuaries indicates that this species' compensation depth would range from 1–1.3 m or from 4–5.2 m seasonally at normal turbidity extremes, 1 per cent surface illumination to 1 or 4 m respectively. This

indicates that increase in day length from December to June would be of greater direct significance to *Thalassiosira* than the increase in surface illumination. The latter would affect *Thalassiosira* indirectly by increasing water temperature.

Initial concentrations to 40 μg -atoms inorganic nitrogen per liter produced 6.1×10^7 cells/ μg -atom N under 5375 lux continuous illumination. Further increases to 1000 μg -atoms $\text{NO}_3\text{-N}$ /liter showed increased population levels but reduced utilization efficiencies. Combinations of nitrate, nitrite, ammonium, and urea nitrogen consistently produced fewer cells than single nitrogen sources. With 12 hours of illumination per day, the diatom produced 1×10^7 cells/ μg -atom nitrate, nitrite, or ammonium nitrogen due to light limitation. Urea and n-acetyl glucosamine yielded 42 per cent and 3.5 per cent of the inorganic source production, respectively. Cultures with approximately 3 μg -atoms N/liter were nitrogen limited but also showed the reduced density effect of the 12-hour illumination period.